# 17638

**21415**

**3 Hours / 100 Marks** Seat No. | | | | | | | | |

*Instructions* – (1) All Questions are *Compulsory.*

(2) Answer each next main Question on a new page.

(3) Illustrate your answers with neat sketches wherever necessary.

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

(6) Mobile Phone, Pager and any other Electronics Communication devices are not permissible in Examination Hall.

**Marks**

**1.** a) **Attempt any <u>THREE</u> of the following:** **12**

(i) Draw symbols and VI characteristics of following devices:

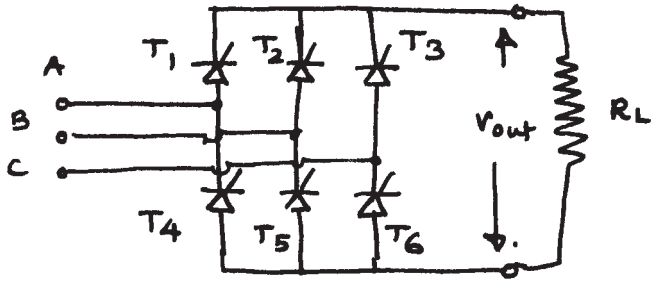
1) GTO

2) IGBT

3) LASCR

4) TRIAC

(ii) Following figure shows circuit diagram of a six-pulse converter. With supply phase sequence A-B-C, indicate the firing sequence of six thyristors. (Refer Fig. No. 1)




**<u>Fig. No. 1</u>**

P.T.O.

**Marks**

(iii) Draw circuit diagram of single phase full bridge inverter. Draw waveforms of load voltage and load current for R-L load.

(iv) Explain the technique for speed control of DC series motor using thyristor converter.

b) **Attempt any ONE of the following:** **6**

(i) Draw waveforms of the following power electronic circuit for gate pulses pattern as shown in Figure No. 2. Indicate load voltage, current, capacitor voltage.

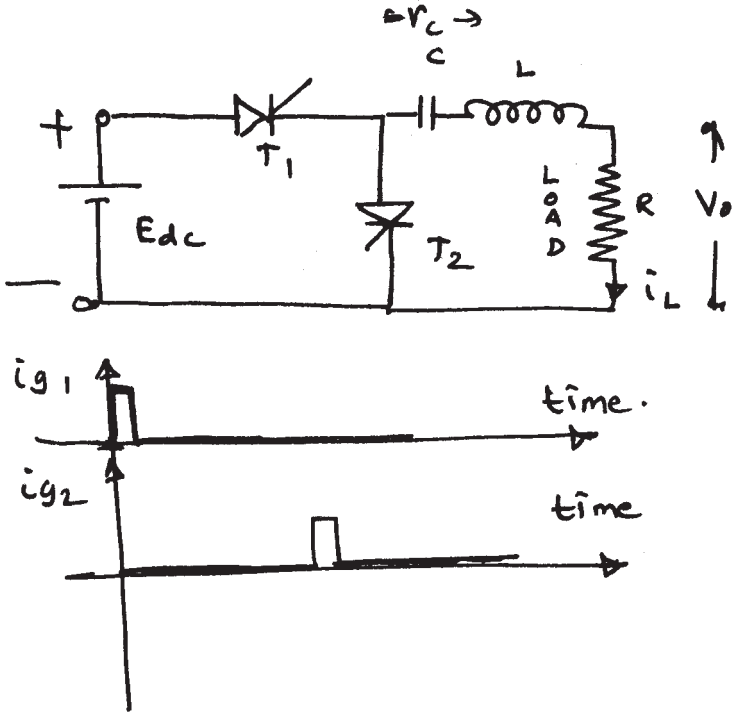



**Fig. No. 2**

(ii) Draw circuit diagram of single phase mid-point converter. Draw output voltage, current waveforms with R-L load.

**Marks**

**2. Attempt any FOUR of the following:** **16**

a) State any four voltage and current rating of thyristor.

b) Draw circuit diagram and waveforms of single phase cycloconverter.

c) Indicate firing angle and conduction angle for half wave controlled converter connected to

(i) R Load

(ii) R-L load

d) Explain turn-OFF methods of a thyristor.

e) Describe how control of firing angle can control speed of DC shunt motor controlled by thyristor converter.

f) Classify choppers based on quadrants.

**3. Attempt any FOUR of the following:** **16**

a) Draw two transistor equivalent circuit of a thyristor and explain turn-ON process.

b) What is effect of connecting freewheeling diode on controlled converter performance?

c) Draw equivalent circuit of thyristor mounted on heat sink. Indicate thermal resistances.

d) Draw schematic circuit diagram of Class-B chopper and necessary waveforms.

e) Draw schematic circuit diagram of thyristorized battery charger.

**Marks**

**4.** a) **Attempt any <u>THREE</u> of the following:** **12**

(i) Describe control techniques for control of chopper.

(ii) Draw circuit diagram of UJT triggering of SCR and draw waveforms to show firing angle control.

(iii) Describe use of thyristor in static VAR compensation.

(iv) Draw circuit diagram of JONES chopper. Draw waveforms of load voltage and capacitor voltage.

b) **Attempt any <u>ONE</u> of the following:** **6**

(i) What is meaning of "Harmonics"? Draw circuit diagram of any one type of harmonic filter used at inverter output.

(ii) Describe speed control of 3pH. Induction motor using Voltage Source Inverter. What is the need of controlling v/f ratio?

**5.** **Attempt any <u>FOUR</u> of the following:** **16**

a) Describe effect of supply inductance on output voltage of converter.

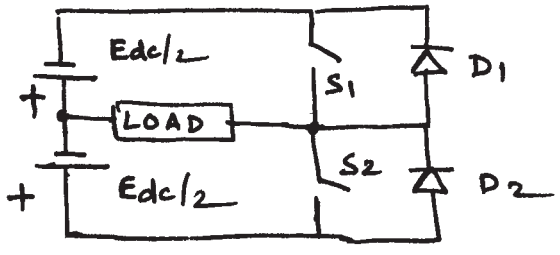
b) Describe working principle of dielectric heating using thyristor.

c) Describe working of basic Current Source Inverter (CSI) based induction motor control.

d) Describe Sinusoidal PWM for control of inverter. Define modulation index.

e) Describe working of electric welding using thyristor.

f) Identify the mistakes in the circuit shown in Figure No. 3 and correct the same and draw voltage output and current waveforms for R-L Load.




**<u>Fig. No. 3</u>**

**Marks**

**6. Attempt any FOUR of the following:** **16**

a) Draw waveforms to indicate turn-ON process of a thyristor. Indicate rise time, delay and spread time.

b) Describe thyristorised induction heating.

c) State differences between MOSFET and thyristor inverter.

d) Describe working of load commutated chopper.

e) Describe street light control using thyristor.

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